WHAT IS CLAIMED IS:

1. A gradient structure material comprising: a substrate and a functional material formed on the substrate, wherein the material is thermally treated while a desired gradient temperature is applied to a specific direction and a specific region of the functional material on the substrate.

2. The gradient structure material according to claim 1, wherein the functional material is in connection with properties of an electrically conductive carrier.

3. The gradient structure material according to claim 1 or 2, wherein the functional material on the substrate is heated while the desired gradient temperature is applied to the specific direction and the specific region with film formation.

4. The gradient structure material according to claim 1 or 2, wherein the functional material on the substrate is thermally treated while the desired gradient temperature is applied to the specific direction and the specific region after film formation.

5. The gradient structure material according to any one of claims 1 to 4, wherein the functional material on the substrate is thermally treated while the desired gradient temperature is applied to the specific direction and the specific region in a dilute reactive gas.

6. The gradient structure material according to any one of claims 1 to 5, wherein gradient temperature having

the specific direction and the specific region are applied to a plurality of positions of the same functional material.

7. The gradient structure material according to any one of claims 1 to 6, wherein the gradient temperature of the specific direction and the specific region differs with a thermal treatment temperature.

8. The gradient structure material according to any one of claims 1 to 6, wherein the desired gradient temperature is substantially constant in a thermal treatment process.

9. The gradient structure material according to any one of claims 1 to 7, wherein the desired gradient temperature differs on a high-temperature side and a low-temperature side of thermal treatment.

10. The gradient structure material according to any one of claims 1 to 8, wherein the desired gradient temperature is substantially equal on a high-temperature side and a low-temperature side.

11. The gradient structure material according to any one of claims 1 to 10, wherein a material configuration of the functional material before the thermal treatment is amorphous.

12. The gradient structure material according to claim 11, wherein coefficients of thermal expansion of the thermally treated functional material and the substrate are substantially equal.

13. The gradient structure material according to

any one of claims 1 to 12, wherein the functional material on the substrate comprises a single element or multiple elements, or a plurality of combinations of these elements.

14. The gradient structure material according to claim 13, wherein the functional material on the substrate contains various types of impurities of metal elements of the groups 2, 3, 5, 6.

15. The gradient structure material according to any one of claims 1 to 14, wherein a temperature is included which causes a phase transition phenomenon involving a rapid physical property change in a temperature range between a high-temperature side and a low-temperature side of thermal treatment of the functional material with the gradient temperature.

16. The gradient structure material according to any one of claims 1 to 15, wherein the functional material of the substrate is a Si-based, Ge-based, or SiGe-based semiconductor material, and can be used in a Si process.

17. The gradient structure material according to any one of claims 1 to 16, wherein the substrate comprises an oxide film or a nitride film formed on a Si substrate, and the functional material formed on the substrate is a film prepared into a layer-by-layer stacked structure of Si films and Ge films containing impurities of B.

18. The gradient structure material according to any one of claims 1 to 17, wherein the gradient temperature of the functional material on the substrate is in a range

of about 40 to 60 degree C per 8 mm when the temperature increase, and in a range of about 10 to 30 degree C per 8 mm when the temperature decrease when an average thermal treatment temperature is 400 degree C, and a change of the gradient temperature with respect to a whole temperature increase speed is in a range of about 10 to 20 degree C per 8 mm per 100 degree C when the temperature increase, and in a range of about 10 to 20 degree C per 8 mm per 100 degree C when the temperature decrease.

19. A functional element using the gradient structure material according to any one of claims 2 to 18, wherein the functionality associated with the property of the electrically conductive carrier is an electric conductivity, and this characteristic is utilized.

20. A functional element using the gradient structure material according to any one of claims 2 to 18, wherein the functionality associated with the property of the electrically conductive carrier is a characteristic of an electromotive effect, and this characteristic is utilized.

21. The functional element according to claim 19 or 20, wherein a desired functional material on a substrate has a gradient treatment region where thermal treatment is performed with a gradient temperature, and a uniform treatment region where thermal treatment is performed at a constant temperature.

22. The functional element according to any one of

claims 19 to 21, containing a pn-bonding in a part thereof.

23. The functional element according to any one of claims 19 to 22, wherein the desired functional material on the substrate comprises a stacked structure of a super lattice specific resistance, a layer-by-layer structure, a gradient structure structure, a multiple-element constitution, a stacked structure of different types of layered materials, or a combination of them.